

1		$81x^4 - 216x^3 + 216x^2 - 96x + 16$	4	<p>M3 for 4 terms correct or for all coefficients correct except for sign errors or for correct answer seen then further 'simplified' or for all terms correct eg seen in table but not combined</p> <p>or M2 for 3 terms correct or for correct expansion seen without correct evaluation of coefficients [if brackets missing in elements such as $(3x)^2$ there must be evidence from calculation that $9x^2$ has been used]</p> <p>or M1 for 1 4 6 4 1 row of Pascal's triangle seen</p>	<p>condone eg $+(-96x)$ or $+ -96x$ instead of $-96x$</p> <p>any who multiply out instead of using binomial coeffs: look at their final answer and mark as per main scheme if 3 or more terms are correct, otherwise M0</p> <p>binomial coefficients such as 4C_2 or $\binom{4}{2}$ are not sufficient – must show understanding of these symbols by at least partial evaluation;</p>
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[4]

Question			Answer	Marks	Guidance
2			70 000 www	4	<p>throughout, condone <i>xs</i> included eg $(2x)^4$</p> <p>annotate this question if partially correct</p> <p>allow 4 for $70\,000x^4$ www;</p> <p>may also include other terms in expansion. Allow marks even if wrong term selected; mark the coefficient of x^4</p> <p>may be unsimplified, but do not allow 35 in factorial form unless evaluated later</p> <p>M3 for $35 \times 5^3 \times 2^4$ oe</p> <p>or M2 for two of these elements multiplied</p> <p>or M1 for 35 oe or for 1 7 21 35 35 21 7 1 row of Pascal's triangle seen</p> <p>[4]</p>

3		-2560 www	4	<p>B3 for 2560 from correct term (NB coefficient of x^4 is 2560)</p> <p>or B3 for neg answer following $10 \times 4 \times -64$ and then an error in multiplication</p> <p>or M2 for $10 \times 2^2 \times (-4)^3$ oe; must have multn signs or be followed by a clear attempt at multn;</p> <p>or M1 for $2^2 \times (-4)^3$ oe (condone missing brackets) or for 10 used or for 1 5 10 10 5 1 seen</p> <p>for those who find the coefft of x^2 instead: allow M1 for 10 used or for 1 5 10 10 5 1 seen ; and a further SC1 if they get 1280, similarly for finding coefficient of x^4 as 2560</p>	<p>ignore terms for other powers; condone x^3 included;</p> <p>but eg $10 \times 4 \times -64 = 40 - 64 = -24$ gets M2 only</p> <p>condone missing brackets eg allow M2 for $10 \times 2^2 \times -4x^3$</p> <p>5C_3 or factorial notation is not sufficient but accept $\frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1 \times 3 \times 2 \times 1}$ oe</p> <p>10 may be unsimplified, as above</p> <p>M1 only for eg 10, 2^2 and $-4x^3$ seen in table with no multn signs or evidence of attempt at multn</p> <p>[lack of neg sign in the x^2 or x^4 terms means that these are easier and so not eligible for just a 1 mark MR penalty]</p>
[4]					

Question		Answer	Marks	Guidance
4		<p>identifying term as $20(2x)^3 \binom{5}{x}^3$ oe</p> <p>20 000</p>	<p>M3</p> <p>M1 for $[k](2x)^3 \binom{5}{x}^3$ soi (eg in list or table), condoning lack of brackets</p> <p>and M1 for $k = 20$ or eg $\frac{6 \times 5 \times 4}{3 \times 2 \times 1}$ or for 1 6 15 20 15 6 1 seen (eg Pascal's triangle seen, even if no attempt at expansion)</p> <p>and M1 for selecting the appropriate term (eg may be implied by use of only $k = 20$, but this M1 is not dependent on the correct k used)</p> <p>A1</p> <p>or B4 for 20 000 obtained from multiplying out $\left(2x + \frac{5}{x}\right)^6$</p> <p>allow SC3 for 20000 as part of an expansion</p> <p>[4]</p>	<p>xs may be omitted; eg M3 for $20 \times 8 \times 125$</p> <p>first M1 not earned if elements added not multiplied; otherwise, if in list or table bod intent to multiply</p> <p>M0 for binomial coefficient if it still has factorial notation</p> <p>may be gained even if elements added</p>

5	(i)		10 cao	1 [1]		
5	(ii)		$-720 [x^3]$	4 [4]	B3 for $720 [x^3]$ or for $10 \times 9 \times -8 [x^3]$ or M2 for $10 \times 3^2 \times (-2)^3$ oe or ft from (i) or M1 for two of these three elements correct or ft; condone x still included	condone $-720 x$ etc allow equivalent marks for the x^3 term as part of a longer expansion eg M2 for $3^5 \left(\dots 10 \times \left(\frac{-2}{3} \right)^3 \dots \right)$ or M1 for $10 \times \left(\frac{-2}{3} \right)^3$ etc

6	6000	4	<p>M3 for $15 \times 5^2 \times 2^4$;</p> <p>or M2 for two of these elements correct with multiplication or all three elements correct but without multiplication (e.g. in list or with addition signs);</p> <p>or M1 for 15 soi or for 1 6 15 ... seen in Pascal's triangle;</p> <p>SC2 for 20000$[x^3]$</p>	<p>condone inclusion of x^4 eg $(2x)^4$;</p> <p>condone omission of brackets in $2x^4$ if 16 used;</p> <p>allow M3 for correct term seen (often all terms written down) but then wrong term evaluated or all evaluated and correct term not identified;</p> <p>$15 \times 5^2 \times (2x)^4$ earns M3 even if followed by $15 \times 25 \times 2$ calculated;</p> <p>no MR for wrong power evaluated but SC for fourth term evaluated</p>
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7	$32 - 240x + 720x^2$ isw	<p>4</p> <p>B3 for all correct except for sign error(s) B2 for 2 terms correct numerically, ignoring any sign error or for 32, -240 and 720 found or B2 for all correct, including signs, but unsimplified B1 for binomial coeffs 1, 5, 10 used or 1 5 10 10 5 1 seen</p> <p>SC3 for $-240x + 720x^2 - 1080x^3$ isw or for $-243x^5 + 810x^4 - 1080x^3$ or SC2 for these terms with sign error(s)</p>	<p>accept terms listed separately; condone $-240x^1$</p> <p>expressions left in nC_r form or with factorials not sufft</p>
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8	$5 + 2k$ soi $k = 12$ attempt at $f(3)$ $27 + 36 + m = 59$ o.e. $m = -4$ cao	M1 A1 M1 A1 A1	allow M1 for expansion with $5x^3 + 2kx^3$ and no other x^3 terms or M1 for $(29 - 5) / 2$ soi must substitute 3 for x in cubic not product or long division as far as obtaining $x^2 + x$ in quotient or from division $m - (-63) = 59$ o.e. or for $27 + 3k + m = 59$ or fit their k
9	$1 + 2x + \frac{3}{2}x^2 + \frac{1}{2}x^3 + \frac{1}{16}x^4$ oe (must be simplified) isw	4	B3 for 4 terms correct, or B2 for 3 terms correct or for all correct but unsimplified (may be at an earlier stage, but factorial or nC_r notation must be expanded/worked out) or B1 for 1, 4, 6, 4, 1 soi or for $1 + \dots + \frac{1}{16}x^4$ [must have at least one other term]

10	$x^3 + 15x + \frac{75}{x} + \frac{125}{x^3}$ www isw or $x^3 + 15x + 75x^{-1} + 125x^{-3}$ www isw	4	B1 for both of x^3 and $\frac{125}{x^3}$ or $125x^{-3}$ isw and M1 for 1 3 3 1 soi; A1 for each of $15x$ and $\frac{75}{x}$ or $75x^{-1}$ isw or SC2 for completely correct unsimplified answer
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11	(i) 0 www	2	M1 for $\frac{5 \times 4 \times 3}{3 \times 2 (\times 1)}$ or $\frac{5 \times 4}{2 (\times 1)}$ or for 1 5 10 10 5 1 seen	4
	(ii) 80 www or ft 8 x their (i)	2	B2 for $80x^3$; M1 for 2^3 or $(2x)^3$ seen	

12	(i) x^3]	2	ignore any other terms in expansion M1 for $-3[x^3]$ and $7[x^3]$ soi;	5
	(ii) x^2] www	3	M1 for $\frac{7 \times 6}{2}$ or 21 or for Pascal's triangle seen with 1 7 21 ... row and M1 for 2^2 or 4 or $\{2x\}^2$	

13	-2000 www	4	<p>M3 for $10 \times 5^2 \times (-2[x])^3$ o.e. or M2 for two of these elements or M1 for 10 or $(5 \times 4 \times 3)/(3 \times 2 \times 1)$ o.e. used [5C_3 is not sufficient] or for 1 5 10 10 5 1 seen;</p> <p>or B3 for 2000;</p> <p>condone x^3 in ans;</p> <p>equivs: M3 for e.g. $5^5 \times 10 \times \left(-\frac{2}{5}[x]\right)^3$</p> <p>o.e. [$5^5$ may be outside a bracket for whole expansion of all terms], M2 for two of these elements etc</p> <p>similarly for factor of 2 taken out at start</p>	4
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14	(i) (ii) -7 or ft from -their (i)/8	2 2	<p>M1 for $\frac{8 \times 7 \times 6}{3 \times 2 \times 1}$ or more simplified</p> <p>M1 for 7 or ft their (i)/8 or for $56 \times (-1/2)^3$ o.e. or ft; condone x^3 in answer or in M1 expression;</p> <p>0 in qn for just Pascal's triangle seen</p>	4
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15	$-720 [x^3]$	4	<p>B3 for 720; M1 for each of 3^2 and $\pm 2^3$ or $(-2x)^3$ or $(2x)^3$, and M1 for 10 or $(5 \times 4 \times 3)/(3 \times 2 \times 1)$ or for 1 5 10 10 5 1 seen but not for 5C_3</p>	4
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16	375		allow $375x^4$; M1 for 5^2 or 25 used or seen with x^4 and M1 for 15 or $\frac{6 \times 5}{2}$ oe eg $\frac{6!}{4!2!}$ or 1 6 15 ... seen [6C_4 not sufft]	3
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17	20 -160 or ft for $-8 \times$ their 20	2 2	0 for just 20 seen in second part; M1 for $6!/(3!3!)$ or better condone $-160x^3$; M1 for $[-]2^3 \times$ [their] 20 seen or for [their] $20 \times (-2x)^3$; allow B1 for 160	4
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18	$16 + 32x + 24x^2 + 8x^3 + x^4$ isw	4	3 for 4 terms correct, 2 for 3 terms correct, or M1 for 1 4 6 4 1 s.o.i. and M1 for expansion with correct powers of 2	4
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